CLAIMS

1. Apparatus for thermal treatment of a patient's heart, comprising:

a catheter having an elongated catheter shaft with a first fluid flow lumen and a second fluid flow lumen extending therethrough; and

a heat exchanger element mounted on a distal portion of the catheter shaft, the heat exchanger element having a fluid connection with the first fluid flow lumen and the second fluid flow lumen;

the heat exchanger element having an expanded condition wherein the heat exchanger element is configured to make thermal contact with an interior of at least one heart chamber without occluding blood flow through the heart chamber.

2. The apparatus of claim 1, wherein the heat exchanger element is inflatable.

3. The apparatus of claim 1, wherein the heat exchanger element is expandable.

4. The apparatus of claim 1, wherein the heat exchanger element has a thermal insulation layer on at least one side.

5. The apparatus of claim 1, wherein the heat exchanger element has a serpentine path for a heat exchange fluid to flow through the heat exchanger element.

6. The apparatus of claim 1, wherein the heat exchanger element has an approximately cylindrical configuration when in the expanded condition.

7. The apparatus of claim 1, wherein the heat exchanger element has an approximately conical configuration when in the expanded condition.

8. The apparatus of claim 1, wherein a proximal end of the first fluid flow lumen and a proximal end of the second fluid flow lumen are configured for connection to an external heat exchanger.

9. The apparatus of claim 1, further comprising an external heat exchanger and a pumping means in fluid connection with a proximal end of the first fluid flow lumen and a proximal end of the second fluid flow lumen.

10. The apparatus of claim 9, wherein the external heat exchanger is configured to provide a hypothermic heat exchange fluid.

11. The apparatus of claim 9, wherein the external heat exchanger is configured to provide a hyperthermic heat exchange fluid.

12. The apparatus of claim 9, wherein the external heat exchanger is configured to provide a normothermic heat exchange fluid.

13. The apparatus of claim 1, wherein the elongated catheter shaft is configured for transluminal delivery of the heat exchanger element into at least one heart chamber.

14. The apparatus of claim 1, wherein the elongated catheter shaft is configured for transluminal delivery of the heat exchanger element into at least one heart chamber from a peripheral vascular access site.

15. The apparatus of claim 1, wherein the elongated catheter shaft is configured for transluminal delivery of the heat exchanger element into at least one heart chamber from a femoral artery access site.

16. The apparatus of claim 1, further comprising a deployment wire for urging the heat exchanger element toward the expanded condition.

17. The apparatus of claim 1, further comprising a temperature sensor mounted in proximity to the heat exchanger element.

18. The apparatus of claim 1, wherein the heat exchanger element comprises a multiplicity of inflatable ribs arranged around an open central portion of the heat exchanger when in the expanded condition.

19. The apparatus of claim 1, wherein the heat exchanger element comprises a plurality of petal-shaped members arranged around an open central portion of the heat exchanger element when in the expanded condition.

20. The apparatus of claim 1, further comprising means for urging the plurality of petal-shaped members of the heat exchanger element into thermal contact with the interior of the heart chamber.

21. A method for thermal treatment of a beating heart, comprising:

placing a heat exchanger element within at least one chamber of the heart; and

expanding the heat exchanger element to make thermal contact with an interior of the heart chamber without obstructing blood flow through the heart chamber.

22. The method of claim 21, further comprising circulating a heat exchange fluid through the heat exchanger element.

23. The method of claim 21, further comprising circulating a hypothermic heat exchange fluid through the heat exchanger element.

24. The method of claim 21, further comprising circulating a hyperthermic heat exchange fluid through the heat exchanger element.

25. The method of claim 21, further comprising circulating a normothermic heat exchange fluid through the heat exchanger element.

26. The method of claim 21, wherein the heat exchanger element is mounted on a distal end of an elongated catheter shaft.

27. The method of claim 26, wherein the elongated catheter shaft has a first fluid flow lumen and a second fluid flow lumen extending therethrough.

28. The method of claim 27, further comprising connecting a proximal end of the first fluid flow lumen and a proximal end of the second fluid flow lumen to an external heat exchanger and a pumping means.

29. The method of claim 21, wherein the heat exchanger element has an open central portion to allow blood flow therethrough.

30. The method of claim 21, wherein the heat exchanger element is inflatable.

31. The method of claim 21, wherein the heat exchanger element has an approximately cylindrical configuration when in the expanded condition.

32. The method of claim 21, wherein the heat exchanger element has an approximately conical configuration when in the expanded condition.

33. The method of claim 21, wherein the heat exchanger element has a multiplicity of ribs arranged around an open central portion of the heat exchanger element when in the expanded condition.

34. The method of claim 21, wherein the heat exchanger element has a multiplicity of inflatable ribs arranged around an open central portion of the heat exchanger element when in the expanded condition.

35. The method of claim 21, wherein the heat exchanger element comprises a plurality of petal-shaped members arranged around an open central portion of the heat exchanger element when in the expanded condition.

36. The method of claim 21, further comprising inserting the heat exchanger element transluminally into the heart chamber.

37. The method of claim 21, further comprising inserting the heat exchanger element transluminally into the heart chamber from a peripheral vascular access site.

38. The method of claim 21, further comprising inserting the heat exchanger element transluminally into the heart chamber from a femoral artery access site.

39. The method of claim 21, further comprising inserting the heat exchanger element into a left ventricle of the heart.

40. The method of claim 21, further comprising inserting the heat exchanger element into a left atrium of the heart.

41. The method of claim 21, further comprising inserting the heat exchanger element into a right ventricle of the heart.

42. The method of claim 21, further comprising inserting the heat exchanger element into a right atrium of the heart.

43. The method of claim 21, wherein the heat exchanger element is placed in a heart chamber of a patient experiencing an acute myocardial infarction.

44. The method of claim 21, wherein the heat exchanger element is placed in thermal contact with a portion of the patient's myocardium determined to be at risk from ischemic damage and/or reperfusion injury.

45. The method of claim 21, further comprising performing a catheter-based intervention on the patient's heart.

46. The method of claim 21, further comprising performing a surgical procedure on the patient's heart.

47. A method for thermal treatment of a beating heart, comprising:

placing a heat exchanger element within at least one chamber of the heart such that the heat exchanger element is in thermal contact with an interior of the heart chamber without obstructing blood flow through the heart chamber; and

circulating a heat exchange fluid through the heat exchanger element.

48. The method of claim 47, wherein the heat exchanger element is placed in a heart chamber of a patient experiencing an acute myocardial infarction.

49. The method of claim 47, wherein the heat exchanger element is placed in thermal contact with a portion of the patient's myocardium determined to be at risk from ischemic damage and/or reperfusion injury.

50. The method of claim 47, further comprising performing a catheter-based intervention on the patient's heart.

51. The method of claim 47, further comprising performing a surgical procedure on the patient's heart.